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1993  
Executive Research Project  
S76

Mine Warfare:  
Its Implication for the Future of  
Amphibious Operations

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94-07671

94 3 8 110

DTIC QUALITY INSPECTED 5

Unclassified

SECURITY CLASSIFICATION OF THIS PAGE

## REPORT DOCUMENTATION PAGE

1a. REPORT SECURITY CLASSIFICATION Unclassified		1b. RESTRICTIVE MARKINGS	
2a. SECURITY CLASSIFICATION AUTHORITY N/A		3. DISTRIBUTION/AVAILABILITY OF REPORT Distribution Statement A: Approved for public release; distribution is unlimited.	
2b. DECLASSIFICATION/DOWNGRADING SCHEDULE N/A			
4. PERFORMING ORGANIZATION REPORT NUMBER(S) NDU-ICAF-93- <i>A76</i>		5. MONITORING ORGANIZATION REPORT NUMBER(S) Same	
6a. NAME OF PERFORMING ORGANIZATION Industrial College of the Armed Forces	6b. OFFICE SYMBOL (If applicable) ICAF-FAP	7a. NAME OF MONITORING ORGANIZATION National Defense University	
6c. ADDRESS (City, State, and ZIP Code) Fort Lesley J. McNair Washington, D.C. 20319-6000		7b. ADDRESS (City, State, and ZIP Code) Fort Lesley J. McNair Washington, D.C. 20319-6000	
8a. NAME OF FUNDING/SPONSORING ORGANIZATION	8b. OFFICE SYMBOL (If applicable)	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER	
8c. ADDRESS (City, State, and ZIP Code)		10. SOURCE OF FUNDING NUMBERS	
		PROGRAM ELEMENT NO.	PROJECT NO.
		TASK NO.	WORK UNIT ACCESSION NO.
11. TITLE (Include Security Classification) <i>Mine warfare. Its Implications for the Future of Amphibious Operations</i>			
12. PERSONAL AUTHOR(S) <i>R. J. Wallace</i>			
13a. TYPE OF REPORT Research	13b. TIME COVERED FROM Aug 92 TO Apr 93	14. DATE OF REPORT (Year, Month, Day) April 1993	15. PAGE COUNT <i>34</i>
16. SUPPLEMENTARY NOTATION			
17. COSATI CODES		18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)	
FIELD	GROUP	SUB-GROUP	
19. ABSTRACT (Continue on reverse if necessary and identify by block number)			
SEE ATTACHED			
20. DISTRIBUTION/AVAILABILITY OF ABSTRACT <input checked="" type="checkbox"/> UNCLASSIFIED/UNLIMITED <input checked="" type="checkbox"/> SAME AS RPT. <input type="checkbox"/> DTIC USERS		21. ABSTRACT SECURITY CLASSIFICATION Unclassified	
22a. NAME OF RESPONSIBLE INDIVIDUAL Judy Clark		22b. TELEPHONE (Include Area Code) (202) 475-1889	22c. OFFICE SYMBOL ICAF-FAP

## **MINE WARFARE: ITS IMPLICATION FOR THE FUTURE OF AMPHIBIOUS OPERATIONS.**

**Lt. Col R.J.Wallace**

The purpose of this research paper is to explain the importance of amphibious operations in relation to the President's National Security Strategy. The barrier that may hinder our success in future regional conflicts is the amphibious mine. All Third World countries have access to these mines, which can destroy shipping lines of communications and battle plans. In today's environment, with the shrinking defense budget, I stress the requirement to continue funding mine countermeasures' programs. Funding these programs is essential to maintaining our National Security policies throughout the globe.

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# Mine Warfare: Its Implication for the Future of Amphibious Operations

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Justification _____	
By _____	
Distribution / _____	
Availability Codes _____	
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A-1	

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## INTRODUCTION

**"when a \$1000 mine can damage so severely a \$1,000,000,000 ship...  
it is time to do something about it."**

Source: Admiral Edney '91

Mine warfare has both frustrated and served navies for centuries. The early sea mines, floating vessels containing explosives, were first used in the late 1500s. Mine warfare's tactical objectives have not changed significantly over time. Its primary goal is to control the enemy's forces afloat and exaggerate the fears of the ship's crew. Minefields cannot be directly engaged in combat as with enemy forces---they are the ocean's **ambush**, operating on their own logic. My thesis focuses on three aspects of mine warfare as they relate to **amphibious operations**:

- **Amphibious operations** are a key mission in support of the National Security Strategy.
- The Third World potential to proliferate the use of **sea mines**, present a significant challenge to amphibious operations.
- To alleviate the shortfalls in mine countermeasures, it must be matched with adequate funding/priority in research, development and acquisition.

As our naval forces embark on a new strategic vision, in this period of decreasing defense spending, it would be easy to again fall victim to the ocean's ambush by not addressing mine countermeasures. In future conflicts, mine warfare must serve, not frustrate us. Unfortunately, any Third World nation can buy cheap, low cost amphibious mines. Mining operations, such as those conducted during Operation Desert Storm, can influence our military options in regional conflicts and "littoral" warfare.

## **AMPHIBIOUS OPERATIONS & NATIONAL SECURITY STRATEGY**

### History Lesson

During the Korean War, Chief of Naval Operations, Admiral Forrest P. Sherman observed before an amphibious assault on Wonsan: "... When you can't go where you want to, when you want to, you haven't got command of the sea. And command of the sea is a rock-bottom foundation for all our war plans. We've been very submarine-conscious and air-conscious. Now we're getting mine-conscious, beginning last week."<sup>1</sup>

A mine countermeasures (MCM) historian believed mining operations in Korea proved the paradox of mine warfare in the United States Navy. For over 140 years the officers and men assigned to MCM had successfully countered mine threats by juryrigging equipment and taking measured risks. So successful were their efforts as perceived by the Navy, that little funding, prestige or interest provided to the subject of countering the mine threat, in war or peace. Failure at Wonsan changed some of that. During the remainder of the war, the inadequate MCM forces succeeded in applying the lessons learned, proving that effective MCM required integration of surface, air and subsurface assets.<sup>3</sup>

Amphibious mining continued to play havoc in North Vietnam, the Suez Canal, the Falkland Islands and in Operation Desert Storm. During the Gulf War, Iraqi mining operations in the coastal waters and prospective assault beaches directly influenced plans for possible amphibious operations. During Operation Desert Storm, Admiral Frank B. Kelso II said it best: "I believe there are some fundamentals about mine warfare we should not forget. Once mines are in place, they are quite difficult to get rid of. That is not likely to change. I think it is probably going to get worse, because mines are going to get more sophisticated."<sup>4</sup>

### New World Order

The ending of the Cold War and a bipolar world established a New World Order.

Although the United States remains the world's superpower (politically, militarily, and economically) our powers will decrease in relation to the growth of competing states. We are experiencing a strategic change, forcing a new international role for our military forces. Our national strategy has shifted from deterrence to regional crisis management. In regional conflicts **amphibious operations** have an increased political viability.

The Department of the Navy is reshaping strategy, force structure and mission priorities. The National Strategy for Third World scenarios requires flexibility in planning, training, and force employment. We need the capability to respond quickly and effectively to unpredictable political and military threats. The military threat may include modern armor, air defense systems, chemical weapons, ballistic missiles and not least amphibious mines. Maintaining the capability to negate the mine threat provides us the options necessary to execute the National Security Strategy.

### President's National Security Strategy

America's National Security Strategy for the New World Order is critically dependent upon our ability to satisfy four fundamental demands:

- strategic deterrence and defense
- forward presence
- crisis response
- retain the national capacity for reconstitution<sup>s</sup>

Dealing with international uncertainties and our domestic social/environmental issues, will increasingly absorb resources, yet we must remain engaged globally. Political pressure and domestic economic considerations, coupled with lessened global threats, will reduce our military forces and overseas presence. Fiscal realities require us to reevaluate military roles and missions. However, even today interests and objectives remain the same:

- Our survival as a free and independent nation, values intact and people secure.
- Provide for a growing economy and cooperative relations among our allies.
- A secure world where we have political and economic freedom, human rights and a chance for democratic institutions to prevail.
- Remain diplomatically engaged throughout the world.

The National Security Strategy involves reorganizing our military forces, developing weapon systems, increasing technology research & development, defense conversion and preventing the proliferation of nuclear weapons. We intend to maintain a quality military force with technological superior weapons. In order to conduct traditional military missions in the face of ambiguous threats, we are defining a new requirement for flexibility: We must:

- Respond on short notice to crises throughout the world.
- Flexible in nature; fighting from the sea, land and air.
- Support long and short-term scenarios.
- Adapt for joint operations and tailored for our national needs.

Simultaneously we are increasing emphasis on non-traditional roles. Humanitarian assistance, peacekeeping, peacemaking and disaster relief are increasingly important. Conceivably, these will be multilateral operations, coordinated by the United Nations, with the United States providing the leadership, trust and confidence to the coalition. This collective action combines international commitment with U.S. strategic reach and flexibility. At the same time, we must maintain the capacity to operate unilaterally when it's in our national interest.

#### Supporting the National Security Strategy

The Department of the Navy's strategic vision to support the President's National Security Strategy, is articulated in a White Paper entitled "... From the Sea." This document defines a 21st century vision for the Navy and Marine Corps, emphasizing **expeditionary capabilities**.

With a far greater emphasis on joint and combined and combined operations, our Navy and Marine Corps will provide unique capabilities of indispensable value in meeting our security challenges. American Naval Forces provide powerfully yet unobtrusive presence, strategic deterrence, control of the seas and provide sealift if larger scale warfighting scenarios emerge. These maritime capabilities are particularly well tailored for the forward presence and crisis response missions articulated by the President.

Source: CNO "...From the sea." Surface Warfare, December 1992.

Our economic, military and political interests depend on free and open maritime lines of communications. This new vision stresses the importance of "littoral" warfare and maneuver from the sea, providing the nation with naval expeditionary forces uniquely tailored for joint operations.

For example, in Somalia, a Joint Task Force directs relief operations with naval forces operating in "littoral" waters. Food distribution and establishment of the port infrastructure could have been significantly delayed if mines were encountered.

This pattern of humanitarian assistance will be the rule, not the exception in the future scenarios (Bangladesh, Balkans, Cambodia). This changing mission mandates a shift from "blue water" open ocean strategy. A powerful tool for implementing these new missions is the Unified Commander's naval component of the "sea-land-air" team. This highly agile team includes expeditionary forces which provide:

- quick response to crises worldwide
- power projection from the sea
- capability for long or short-term support
- access to territorial waters
- forward presence
- mine countermeasures.

Quick response could be a Naval Task Force consisting of a two to four ship Amphibious Ready Group, providing the initial assault or deterrent force for a crisis. Where access to overseas land bases is unlikely, remaining afloat or overhead may be the only solution. An example of evolving thinking is underway with a unique deployment aboard the U.S.S. THEODORE ROOSEVELT. An embarked 600-member Marine Corps force is conducting a variety of exercises including noncombatant evacuations, tactical recovery of a downed aircraft, and raids on hostile positions.

Navy-Marine Corps officials are still evaluating the concept-something the Navy calls "adaptive force packaging." The test is indicative of the new direction the Navy is trying to take in mapping its future.<sup>6</sup>

Naval forces, tailored to any size or requirement, allow our nation to be proactive in managing regional crises. Therefore, the ability to operate in "littoral" waters with flexible forces, possessing an extended loiter capability is essential to our National Security Strategy. Amphibious mines may restrict our success in this role.

### MODERNIZATION OF MINE COUNTERMEASURES

Despite our decline in military resources, manpower and defense spending, we must continue our mine countermeasures programs to support the National Strategy. Lessons learned from Desert Storm and the potential Third World proliferation of sea mines accentuate the need for a modern and aggressive mine countermeasures program. The sea services have now set forth programs and initiatives to resolve MCM shortcomings and upgrade existing systems.

Articles like Colonel Thomas Blickensderfer's, "Amphibious Mines: Silent Enemy of the Landing Force", stress follow-through in our initiatives to obtain an efficient and effective mine countermeasures capability.<sup>7</sup> Mine countermeasures programs, training, and resources must exist, not be a potential capability. When a crisis erupts, delay in responding could allow a situation to get out of hand.

## Search for Excellence

- Threat
- Requirements
- Shortfalls & Solutions

### THREAT

#### Third World

Primitive and sophisticated "state-of-the-art" amphibious mines are available to Third World actors. The former Soviet Union mine inventory exceeds 350,000 weapons. Recent estimates suggest that forty-five nations have mine warfare capabilities. The Mine Warfare Plan counts thirteen mine-producing countries, including Iraq, Yugoslavia, China, North Korea and South Africa. China sells mines to a variety of countries including Bangladesh. The Chinese market a rocket-propelled rising mine that could be deployed in deep water against both submarines and surface ships.<sup>8</sup>

#### Funding, Interest, and Priority

In time, we could lose the funding or interest to solve our mine countermeasures shortfalls. However, we must not allow this to happen. The MCM programs appear to have support in Congress and we should capitalize on that interest. We must continue to remind our decision makers and legislators that a robust MCM capability is essential to the National Security Strategy. I believe the interest and priorities are in place today; but will it be there in five or ten years?

## REQUIREMENTS

### Mine Countermeasures Forces

The Center for Naval Analyses recently conducted a cost-benefit analysis for each of our mine countermeasure's platforms and forecast the most cost effective force level mix.

Their analysis identified the need for a force structure that includes: fourteen Mine Sweeper Ocean class ships (Avenger), twelve Mine Hunter Coastal class ships (Osprey) and thirty-eight MH-53 helicopters.<sup>9</sup>

The assessment of airborne and surface force requirements was based upon the Joint Chiefs of Staff planning factors for near simultaneous Major Regional Contingencies in Southwest Asia (MRC-East) and Northeast Asia (MRC-West).<sup>10</sup> Our surface forces are replacing all Mine Sweeper Ocean ships by 1996 with the Avenger Class and adding the Osprey Class Mine Hunter Coastal ships in 1993. This will provide us with twenty-six new mine warfare ships by the end of fiscal year 1996.

Our airborne mine countermeasure's force requires thirty-eight MH-53E aircraft, which considers pipeline requirements, attrition and authorized allowance. A squadron is on a twenty-four-hour readiness posture for C-5 transport around the world. If the surface, explosive ordnance disposal and airborne force numbers decrease, we could only support one major regional contingency and possibly a minor contingency, such as Somalia, with our MCM forces.

### Administrative Organization

The "...From the Sea." vision provides closer integration of the Navy/Marine team and an administration reorganization within the

Office of the Chief Naval Operations. To support the fleets resources, warfare and assessments to requirements, the Deputy

Chief of Naval Operations reorganized the separate warfare areas into one department which includes:

- Expeditionary Warfare (N85)
- Surface Warfare (N86)
- Submarine Warfare (N87)
- Air Warfare (N88)
- Special Programs (N89)

The expeditionary warfare division, headed by a Marine Corps Major General, establishes plans and conducts warfare assessments for amphibious assault ships, mine warfare and naval special forces. Expeditionary warfare is on equal status with surface, aviation and submarine warfare specialties. Within the N85 division, mine warfare (N852) has resident expertise resources and programming authority to continue with their initiatives and programs. There was some initial opposition to this change within the Department of the Navy. However, I believe we have greater flexibility, visibility and fleet support, which should maintain the thrust of this new organizational initiative.

### Operational Organization

Traditionally, mine warfare was not institutional in battle force doctrine, which put it "out-of-sight and out-of-mind." In the Navy's evolving doctrine, mine warfare is totally integrated within the warfighting team. The overall task force commander will have an institutionalized mine warfare expert as a subordinate commander.

The mine warfare mission area responsibilities are:

- Direct mine warfare activities of the task force for battle groups and the amphibious ready force.
- Prepare mine warfare plans (offensive and defensive), tactics, and intelligence tasking and distributing.
- Direct, including positioning of, forces allocated for mine defense.
- Plan and protect MCM forces engaged in mine surveillance, sweeping or neutralization.
- Command mine countermeasures forces when so directed.

#### Technology Transfers

Recently, the NATO mine warfare conference discussed lessons learned from the Gulf War and formulated a report focusing on successes and failures. The result of this conference motivated the Navy to investigate many foreign systems for addition to our inventory, in particular, some remote control technologies. Most notable of these is the West German TROIKA, a remotely controlled magnetic/acoustic influence sweep. We also purchased two remotely operated Swedish systems for sweeping magnetic and acoustic mines.

These systems will provide an interim upgrade of our capabilities, while we continue our own research and development programs. The U.S. and French program for ship construction should continue and allows for standard ship construction, ensuring optimally low magnetic signatures irrespective of ship location.

### Wargaming

Wargaming provides a cost-effective means to evaluate mine reconnaissance, in-stride capability and clandestine neutralization with command and control. It can program the ability to detect and synchronize mine clearing operations with amphibious operations.

### Program Executive Officer

Establishing the Program Executive Officer for mine warfare, streamlines the acquisition management functions and hastens the procurement of mine warfare systems.

Responsibilities include acquisition, life cycle support and management accountability for six primary programs:

- surface MCM
- airborne mine defense
- amphibious MCM
- explosive ordnance disposal systems and equipment
- selected very shallow water MCM
- magnetic silence program

This realignment provides interface with Naval Sea Systems Command and Marine Corps Systems Command and appears to be an expeditious and effective means of program management.

## **SHORTFALLS & SOLUTIONS**

### Shallow Water Mine Countermeasures (SWMCM) Program

The primary threats against naval forces operating in littoral waters include sea-skimming missiles, tactical ballistic missiles and most importantly amphibious mines.

Each of these threats tax our current systems and inhibit our ability to effectively operate from the open ocean to the shore. One critical lesson from Operation Desert Storm was the fact that our MCM capabilities, in support of over-the-horizon amphibious power-projection operations, were inadequate to meet the perceived threat in the shallow water to craft landing zone environment. In response to Congressional interest, the Commandant of the Marine Corps outlined his SWMCM goals in testimony before the Senate Armed Services Committee, 5 May 1992.

The Navy and Marine Corps objectives in this critical warfighting area are to achieve covert detection and avoidance in the near term and underway clearance in the long term.<sup>11</sup>

The operational shortfalls during Operation Desert Storm and Earnest Will show there were no:

- Proven MCM techniques for very shallow and surf zone, except SEALS.
- Effective wide area reconnaissance or classification capability.
- System to detect buried mines other than marine mammals.
- Means other than visual sighting, and under certain circumstances IR detection, to counter floating mines while enroute.
- Means of conducting MCM operations in opposed waters.
- Means of conducting clandestine MCM operations, except SEALS.
- Safe means of conducting night time hunting or sweeping.
- Methods of conducting hunting, sweeping or neutralization remotely and from safe stand-off.

The SWMCM program developed near and long term solutions to mine and obstacle barriers to resolve Gulf War shortfalls. Near-term (1992-2001) objectives include:

- developing concepts of operations in which the Marine Corps will seize the beach to provide a benign environment for follow-on MCM forces
- using existing MCM systems and modifications to those systems
- emphasizing joint Navy/ Marine Corps MCM training

The far-term (2002-2007) objectives include:

- developing concepts of operations in which Navy MCM and Marine forces will carry out concurrent detection/neutralization operations during the over-the-horizon operation: Navy/Marine forces must work within a two-hour pre-assault window within twenty-five nautical miles of the shore.
- developing new MCM systems<sup>12</sup>

The following SWMCM programs need sustained funding and priority to solve functional area shortfalls (cannot withstand any horizontal budget reductions):

- **Reconnaissance**
  - magic lantern 90
  - magic lantern 90 adaptation (not funded after 1993)
  - sonar improvements
- **Shallow water/Very shallow water**
  - high speed remote influence sweep ( SAM 11)
  - diver equipment
  - sweep improvements
  - night capable airborne MCM (not funded)
  - very shallow water moored contact sweep (not funded)
  - breach lane navigation/markings

- **Surf Zone and Craft Landing Zone**
- advanced countermine system
- distributed explosive technology
- improved line charge
- obstacle breaching
- amphibious assault vehicle rake
- antipersonnel obstacle breaching system
- T5 dozer/rake
- shallow water test pond

The following technologies will enhance our shallow water MCM capability:

- |                            |                         |                             |
|----------------------------|-------------------------|-----------------------------|
| • Detection                | • Clearing              | • Neutralizing              |
| - multi-spectrum           | - pressure sweeps       | - moored mine neutralizer   |
| - ground penetrating radar | - pulsed power          | - hyper-velocity penetrator |
| - synthetic aperture radar | - electromagnetic pulse | - pulsed power              |
| - satellites               |                         | - electromagnetic pulse     |

#### Night Capable Airborne Mine Countermeasures

There is a "mission need statement" that outlines the requirements for a night airborne mine countermeasures capability. A night capable force would provide rapid minefield location, mine hunting and "influence" mine sweeping "around the clock." This proposed capability supports over-the-horizon, covert, rapid deployment of power projection forces by:

- decreasing AMCM response times
- decreasing time lines necessary to achieve mine clearance objectives
- providing greater operational flexibility<sup>13</sup>

Third World mine proliferation is normally focused on choke points (Straits of Hormuz) and littoral regions (Somalia). The success of expeditionary forces depends on AMCM's ability to clear or avoid mine areas with its tow operations. Funding a night capability enhances: (1) pre-assault reconnaissance/clearance for the amphibious task force, (2) precursor operations for surface mine countermeasures forces, (3) assault lane clearance operations from over-the-horizon for the surface elements.

Night missions require pilot night vision goggle training, compatible aircraft night vision enhancement systems and integration of coupled automatic flight control systems. Some programs and systems that could meet these requirements are:

- Forward looking infrared radar
- Night vision goggles
- Heads up display
- United States Air Force Pave Low
- Cockpit/cabin lighting systems
- 1553B data bus compatible hardware as required to provide navigation system/AFCS interface<sup>14</sup>

I also recommend the requirement for a self-defense system (AAR-47 or similar system) and chemical biological and radiological protection. Another concern is the lack of armed helicopter escort support. Some options may be Marine Corps gunships (presently a limited resource), land-based, or sea-based aviation assets from other services, including special operations forces. This will be a difficult problem to resolve, but worth researching.

### Consolidation of Forces

The fiscal year 1993 Defense Authorization Act required the Navy to submit a report on its' plans for centralizing MCM programs. This report flatly stated that it has backed up words on MCM programs with dollars, noting funding in the fiscal year 1993 budget increased by \$50 million. While full implementation of the diverse aspects of the plan will come in the fiscal year 1993 to 1999 defense programs, the fiscal year 1993 enhancements are a solid base for future success.<sup>15</sup> The Navy wants to consolidate mine warfare forces at Ingleside, Texas. However, the consolidation decision faces opposition from both politicians and constituents.

The Navy's "own" Center for Naval Analysis study found the move too expensive. However, the decision should consider long-term benefits, such as training and readiness issues which are difficult to quantify. Former Secretary of the Navy Sean O'Keefe reinforced this position by stating, "The highly desirable combination of operational, training and other advantages considered in the original Ingleside decision remains the driving factor in (Ingleside) homeport selection. It will become an MCM Center of Excellence."<sup>16</sup>

This single-site location would place all three MCM forces under immediate control of the Commander, Mine Warfare Command (COMINEWARCOM) and provide improved support for the "Type Commanders." The Navy's position is straight forward. "The Navy says it is Ingleside," said Capt. O'Donnell, outgoing head of mine warfare. Ingleside is the ideal site for consolidation of all mine warfare capabilities because:

- It already has dedicated, modern facilities for mine warfare to fit these forces and serve as a center for excellence.
- It has ready access to the Coastal Systems Station in Panama City, Florida that has instrumented facilities and ranges for training.
- Its central location provides equal access to forward deployment areas in both the Pacific and Atlantic Oceans.
- It offers good environmental factors, such as deep water, good weather, and clear water-all necessities for mine warfare training.<sup>"17</sup>

Of course, like everything else, money and politics are the driving factors in not relocating. The Navy feels they can improve operational effectiveness from this single-site location and the long-range benefits overshadow the initial argument for not relocating.

#### MCM Command Ship

One shortcoming in the Gulf War was the lack of a dedicated command and control ship for the MCM forces. In Operation Desert Storm the primary MCM platform accomplished missions other than mine countermeasures: passengers, mail, cargo, assault support.

The Navy plans to spend \$131 million in fiscal year 1994 to convert an existing LPH class ship for MCM. Completion of this ship would be a major milestone for supporting the fleet commander and must be a priority in the Defense budget.

#### REQUIRED CAPABILITIES FOR THE MCM SUPPORT SHIP

- Embark MCM commander and staff
- Provide command and control for MCM forces
- Embark and operate eight AMCM MH-53Es
- Embark four EODMCM detachments
- Embark and support special warfare forces for SWMCM, VSW/Surf zone mine clearance.
- Provide tailored logistical support/OMA/IMA maintenance support for embarked units
- Provide limited self defense

Source: Doroshenk, Theodore CAPT. USN. Program Review, 20 November 1992.

#### Overseas Homeports

The world's most likely theater for MCM operations is the Persian Gulf. Restricted waters, the many tankers carrying valuable cargo and the tangled international relations of the Persian Gulf combine to make it an MCM hot spot.

Deficiencies in surface MCM are the thirty-day transit time from CONUS and wear and tear on the ships. "To have forces already forward-deployed really makes good sense, with the possible exception of some political problems," Rear Admiral Phillip Quast told a meeting of the Naval Order of the U.S. and the Surface Navy Association.<sup>18</sup>

Congressional Research Service analyst Ron O'Rourke notes that overseas home porting of MCM ships does not necessarily mean fewer ships to support daily operations, because these ships do not keep station like other combatants. He added that homeporting could let the Navy maintain the same forward presence it has today, but with a smaller force. A home port in Bahrain benefits the entire world's MCM capability and is in line with our National Security Strategy. The infrastructure is there. But, is the political will?

#### Heavy-Lift Ships

The poor condition of the MCM ships when they reached the Gulf has already been noted. It appears the Navy has decided against funding its own heavy-lift assets. We will probably rely on commercial assets for transportation. However, only nineteen international merchant ships are available to do the job and political problems could make some unavailable.

Nonetheless, during 1992 the Navy analyzed the cost and feasibility of contracting, leasing or acquiring existing vessels to meet SWMCM heavy-lift requirements. While there are advantages to an organic Navy heavy-lift capability, the analysis showed that it is more cost-effective to spot such vessels on the commercial market as the need arises.<sup>19</sup>

We must keep this issue in sight as political alliances and other factors impact the availability of these type assets. Self-deployability will further reduce dependence.

#### Training

One key to combat effectiveness is integrating of MCM exercises with the operational force training.

The Navy completed its first integrated exercise off Ingleside, Texas with great success. Captain Craig Sackett, the deputy chief of staff for MCM operations, for mine warfare command said: "In the past, the Navy did not conduct integrated mine warfare training exercises. The Navy identified integrated training as a problem and is making strides to change, particularly now that mine warfare is in the service's forefront for mission priorities. They also emphasize the need to integrate mine warfare with amphibious training as well."<sup>20</sup>

Incorporating MCM scenarios as part of the tactical testing requirement ensures the entire task force is mine conscious. There are other integrated exercises planned, but these are longtime coming. A NATO exercise, BLUE HARRIER, in April 1993, will be the first time NATO forces have worked with our AMCM forces.

This will be the first major training deployment for mine warfare in many years where the Navy will try to sustain four ships, obviously with very small crews, and transit them across the ocean to play major exercises. We are staking a lot on it. We hope it goes well. We think they are ready.<sup>21</sup>

#### Future Assault Craft

When procuring future amphibious assault vehicles, mine countermeasures objectives need to be considered. This will ensure that vehicles leading us into the year 2000 have the lowest possible signature, reducing the time sweeping before an amphibious operation.

### Defense Industry Base

Mines have changed in character, evolving from simple charges initiated from shore observation posts, to influence triggered devices of growing sophistication. Maintaining open communications with defense industry is critical in today's post-Cold War era. President Clinton outlined several goals in his National Defense Strategy. Identifying and funding core capabilities needed for the post-Cold War is one stated goal. I believe research and development in mine countermeasures is a "core capability" in keeping up with the intent of his strategy.

## CONCLUSION

Amphibious capabilities are essential in support of the President's National Security Strategy. One barrier that may restrict our success in regional conflicts or "littoral" warfare is

amphibious mines. Any Third World country can obtain mines and laying them is easy.

They can disrupt shipping lines of communication and destroy battle plans; yet few nations possess the mine countermeasures capability to overcome the threat.

Along with our Allies, we must proceed "full steam ahead" with initiatives and programs to improve our MCM posture. Matched funding and priority is necessary in research, development and acquisition. Detection and avoidance are the near term goals, while underway clearance is the long term.

The sum of these initiatives, once completed, will ensure that amphibious landings opposed by enemy mines will be made if called upon, thus removing the Achilles' heel from our amphibious force.<sup>22</sup>

We need dedicated resources to acquire remote control technology. The Swedish SAM concept and the German Troika systems are concepts we should pursue, which would enable us to accomplish MCM missions from a stand-off distance. Ships would then not have to be acoustically or magnetically quieted---that savings could be applied to MCM.

There are major benefits of marine mammal research and development that have not yet been mastered. Understanding how mammals detect buried mines will allow software/hardware implementation of similar capabilities. We should develop mammal-like systems, rather than mammal systems. There is much that can be done in upgrading material increases in MCM performance. The Special Forces should have a non-magnetic breathing apparatus, or other dive gear and also provide them an effective means of underwater navigation.

### MINE COUNTERMEASURE REQUIREMENTS

- The resources to improve the readiness of existing MTW forces.
- A single flag officer responsible for and possess the authority to direct our MCM forces, including operational control of MCM forces.
- MCM training and exercises, personnel development programs that will enhance current operational capabilities and provide a cadre of highly skilled and motivated mine warfare people.
- The resources and platforms necessary to provide lift, support and command & control for our deployed forces.
- The problems of conducting efficient and speedy MCM operations in very shallow water, surf zone, and craft landing zone environments in support of amphibious operations.

Source: Mine Warfare Plan, CNO, 29 January 1992

Mine exercises can be improved by incorporating technologies developed for anti-submarine warfare, such as position logging and feedback. Accuracy of MCM equipment should be validated at Fleet ranges.

Other dominant programs are development of systems to accomplish sweeping, hunting and neutralization remotely; the development of electro-optic systems for detecting sea mines in shallow water and surf zones; the development of high resolution sonars for rapid classification; and the employment of active magnetic signature cancellation methods.

By maintaining priority and interest over time we will improve our mine countermeasures capability. Let's keep it a high visibility program and not a defensive "backwater" of modern naval operations. It is necessary for the implementation of our National Security Strategy, which includes the execution of amphibious operations.

## ENDNOTES

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